



## Development of Problem Based Learning Devices in Two Variable Linear Equation System Materials

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### ABSTRACT

The student learning activities do not support developing mathematical problem solving abilities. One of the factors is the learning tools used have not provided the opportunity for students to hone their mathematical problem solving skills. This study aims to produce a valid and practical semester VIII class SMP mathematics learning device for use by using the Problem Based Learning Model with a scientific approach to the SPLDV material. This type of research is a development research with the ADDIE development model which includes the following steps: (1) analysis, (2) design, (3) development, (4) implementation, (5) evaluation. Data were collected through observation, interviews, and student response questionnaires. The subjects of this study were students of class VIII MTS GUPPI Bandar Sungai. Data analysis techniques used qualitative and quantitative statistics. Based on the results of data analysis, information was obtained that the learning device met the valid and practical criteria. The results of the validity of the learning tools in the form of a syllabus with a percentage of 82.99%, RPP 85.75% and LKPD of 83.23% fulfilled the validity level, namely valid. The results of the practicality of the learning tools seen from the student response questionnaire were 92%, these results met the practicality level, which was very practical, while in terms of the teacher's observation sheet it fulfilled the practicality level of 87.78% fulfilling the very practical level.

## 1. Introduction

Learning mathematics at the primary and secondary education levels aims to make students (1) understand mathematical concepts; (2) Using patterns as guesswork in solving problems, and being able to make generalizations based on existing phenomena or data; (3) Using reasoning in nature, performing mathematical manipulations both in simplification, and analyzing the components

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that exist in problem solving in the context of mathematics and outside mathematics (real life, science, and technology); (4) Communicating ideas; (5) Having attitudes and behavior in accordance with the values in mathematics and learning; (7) Perform motor activities that use mathematical knowledge; (8) Using simple teaching aids and technological results to carry out mathematical activities (Permendikbud No.58 of 2014). Based on these objectives, it is known that problem solving ability is one of the abilities that students need to have. In an effort to improve the learning process and these abilities, it is necessary to develop learning tools as one of the factors that affect learning activity and outcomes. One of the means that is fulfilled is learning tools that are in accordance with the curriculum used and can facilitate students in improving problem-solving abilities. Therefore, the development of learning tools can be used as an effort that can be researched and studied in improving the quality of education.

In general, mathematics learning in schools is still centered on the teacher so that it does not develop students' problem solving abilities. With conventional learning, students still have difficulty developing problem-solving abilities. In an effort to improve the learning process and these abilities, it is necessary to develop learning tools as one of the factors that affect learning activity and outcomes. One of the means that is fulfilled is learning tools that are in accordance with the curriculum used and can facilitate students to improve their mathematical problem solving abilities. Learning devices that are in accordance with the 2013 Curriculum are learning tools that use objects of natural, social, artistic and cultural phenomena as well as in learning using a scientific approach (observing, questioning, gathering information, associating, and communicating) and using technology, information and communication facilities. (Wayan et al., 2014). The learning device is a tool that is used in the teaching and learning process. Therefore, every teacher in an education unit is obliged to arrange learning tools that take place in an interactive, inspirational, fun way, motivating students to participate actively (Poppy et al., 2009).

Based on the researcher's interviews with SMP / MTS teachers in Siak Regency, the learning devices used were not in accordance with the demands of the 2013 curriculum, one of which was that the teaching materials did not contain facts, concepts, principles and sleep processes. Learning activities do not lead to a learning model, assessment only focuses on cognitive aspects and does not include psychomotor assessments. Researchers develop learning tools that are in accordance with the 2013 curriculum on teaching materials containing facts, concepts, principles and procedures. Learning activities lead to a learning model that is in accordance with the 2013 curriculum, the assessment does not only focus on cognitive assessments but also psychomotor assessments.

The learning designed by the teacher should refer to the 2013 curriculum which is oriented towards a scientific approach. The scientific approach is a learning process designed in such a way that students actively construct concepts and laws or principles through stages. The steps in the scientific approach include (1) observing, (2) asking, (3) gathering information, (4) reasoning, and (5) communicating. The scientific approach is intended to provide understanding to

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students in recognizing and understanding various materials using a scientific approach, therefore teachers are expected to be able to apply the scientific approach in learning tools. So that students play an active role in following the learning process.

One learning model that is in line with the scientific approach is Problem Based Learning. Problem Based Learning (PBL) is a learning model that uses real-world problems as a context or problems for students to learn about critical thinking and problem-solving skills, and can acquire essential knowledge and concepts from subject matter (Kunandar, 2011) . If usually the learning process begins with the provision of subject matter, then proceed with giving problems, then learning with PBL makes giving problems the start of the learning process. Through solving these problems, students will be directed and guided to construct knowledge from the material being studied.

Problem Based Learning is a learning model with a student learning approach to authentic problems so that students can compile their own knowledge, develop higher skills, become independent of students and increase self-confidence (Arends, 2008). Problem-based learning is learning that exposes students to practical problems as a foothold in learning or in other words, students learn through problems (Wena, 2009). Problem-based learning is an effective approach to high order thinking. The Problem Based Learning Model is a teaching model characterized by real problems as a context for students to think critically and to solve problems and acquire knowledge (Duch in Sohimin, 2014).

Thus, the Problem Based Learning model is a learning model characterized by the existence of real problems as a context for students to think critically and problem-solving skills and gain knowledge. The most important aspect of the Problem Based Learning model is that learning starts from a problem, from which the problem will determine the direction of learning in groups. By making problems as a basis for learning, students are encouraged to find the information needed to solve problems.

The Problem Based Learning model has five steps or phases, namely: (1) orientation to the problem; (2) organizing to study; (3) guiding individual and group investigations; (4) develop and present the work; and (5) analyzing and evaluating the problem-solving process (Ridwan, 2015). Based on this description, the researchers developed learning tools in the form of a syllabus, lesson plans (RPP), and student worksheets (LKPD) with a problem-based learning model with a scientific approach as the main approach in the 2013 curriculum.

Student worksheets (LKPD) are one of the learning tools used as teaching materials to support the learning process. The LKPD used in schools has not directed students' activities to practice problem solving skills, the steps in the LKPD have not guided students to understand the concept of material through independent problem solving. The questions in the LKPD are still used to practice numeracy skills and rarely form story questions that are related to real life. One of

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the objectives of learning mathematics is so that students are able to solve problems. problem solving ability is one of the important goals in learning mathematics (Kemendikbud, 2014).

Problem solving ability is the ability of a student to use his or her thinking process to solve problems through gathering facts, analyzing information, compiling various alternative solutions, and choosing the most effective problem solving, (Woolfolk in Yustianingsih, 2017). Problem-solving abilities are defined as abilities related to the selection of a solution or a suitable way of action and knowledge of the current conditions leading to the expected situation (Evans in Hasnan, 2015).

Thus it can be concluded that the problem solving ability is the ability of students to solve problems. Based on the description above, the researcher developed a learning tool with the Problem Based Learning model on the subject matter of a two-variable linear equation system.

The learning device developed is said to be of high quality if it meets three criteria, namely valid, practical, and effective (Anik, 2017). Validity is related to the accuracy of the assessment tool for the concept being assessed so that it really assesses what should be assessed (Sudjana in Matondang, 2009). Learning devices are said to be practical if people who use the product think that the product can be used (Sugiyono, 2008).

Based on the description above, it can be concluded that quality learning tools are learning devices that have been tested for their validity and practicality. From the description explained, the researcher developed a learning device with a Problem Based Learning model that was valid and practical to use.

## **2. Methodology**

### ***a. Types of research***

This type of research is a development research using the ADDIE development model which consists of 5 stages, namely, analysis, design, development, implementation, and evaluation. At the analysis stage, researchers conducted a needs analysis, analysis of student characteristics and curriculum analysis. Needs analysis was carried out to see the availability of learning tools as a reference for the development of learning devices, analysis of student characteristics was carried out to see the level of students' abilities as a guide in the development of learning tools in the form of LKPD. Curriculum analysis is carried out to see the material to be developed.

### ***b. Research design***

The development model used in this research is the ADDIE development model. The ADDIE development model was developed by Dick and (Carry, 1996). The

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ADDIE development model consists of five stages: analysis, design, development, implementation, and evaluation.

### ***c. Product Development Procedure***

The design stage is the pre-planning stage, at this stage the researcher makes a design of learning tools in the form of a syllabus, RPP and LKPD and develops an assessment instrument. The next stage is development, at this stage the researcher develops learning tools based on predetermined designs, the results of the development stage are then revised according to suggestions from the validator. The fourth stage is implementation, here the researcher conducts limited trials and field trials. In the limited trial stage the researcher tested 8 students and the field trial was carried out on 60 students with 30 students in the experimental class and 30 students in the control class. The last stage is the evaluation stage where the researcher performs a validity analysis and a practicality analysis. Validity analysis was carried out to see the level of validity of learning devices and practicality analysis was carried out to see the level of practicality of learning devices.

### ***d. Research Data and Instruments***

The instruments used in this study were learning device assessment sheets, student response questionnaires, teacher response questionnaires and observation sheets. The explanation of each instrument is as follows.

The learning device assessment sheet is used to measure the validity of the learning tools developed, namely the syllabus, lesson plans and student worksheet. The learning device assessment sheet will be filled out or assessed by the validator. The validation sheet for the syllabus, RPP and LKPD was made using a Likert scale with the category of assessment (1) very inappropriate, (2) not suitable, (3) appropriate, (4) very suitable. (Asyti et al., 2015). Qualitative data were analyzed descriptively qualitative, suggestions or input from the validator were used as material for improvement at the revision stage of the learning device.

### ***e. Data analysis technique***

Analysis of the data from the validator's assessment was carried out to assess the validity of the developed syllabus, lesson plans and student worksheets. Data analysis from the validation sheet uses the following formula:

$$\bar{M}_V = \frac{\sum_{i=1}^n \bar{V}_i}{n}$$

(adapted from Sudjiono, 2011).

Information  $\bar{M}_V$  : average total validity  
 $\bar{V}_i$  : average validator validator to-  
 $n$  : many validators

The criteria for the validity of the learning device from the validator can be seen in Table 1.

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Table 1. Criteria for the validity of learning devices

No	Achievement Level	Level of Validity
1	85,01% - 100,00%	Very Valid
2	70,01% - 85,00%	Valid
3	50,01% - 70,00%	Less Valid
4	01,00% - 50,00%	Invalid

The criteria for the validity of the learning device from the validator are 01.00% - 50.00% invalid, 50.01% - 70.00% less valid, 70.01% - 85.00% valid, 85.01% - 100, 00% very valid. (Source: Sa'dun (2013)).

Data on the practicality of learning devices were obtained from student response questionnaires and teacher response questionnaires. Analysis of data on the response of students and teacher responses was carried out to assess the practicality of the developed LKPD. Analysis of the result data from the student response questionnaire using the following formula.

$$V_p = \frac{T_{sp}}{T_{sh}} \times 100\%$$

(adapted from Sa'dun, 2015)

Information  $V_p$  : respondent's score  
 $T_{sp}$  : total empirical score of the respondents  
 $T_{sh}$  : total expected maximum score

The criteria for practicality of learning tools in the form of LKPD can be seen in Table 2

Table 2. LKPD Practical Criteria

Interval	Category
85,01% - 100,00%	Very Practical
70,01% - 85,00%	Practical
50,01% - 70,00%	Less Practical
01,00% - 50,00%	Impractical

(Source: Sa'dun Akbar, 2015)

The criteria for practicality of learning tools in the form of LKPD are as follows: 01.00% - 50.00% impractical, 50.01% - 70.00% less practical, 70.01% - 85.00% practical, 85.01 % - 100.00% very practical. (Source: Sa'dun (2013)).

### 3. Results and Discussion

Researchers develop LKPD based on a draft that has been prepared. LKPD is prepared for material on two-variable linear equation systems consisting of five meetings. Activities in the LKPD are arranged by referring to the stages of the problem-based learning model which contains the KPMM indicator. LKPD is arranged consisting of covers, columns as space for students to write answers and supporting pictures. LKPD cover can be seen in Figure 1




Figure 1. LKPD cover

Students are then presented with a column, let's observe problems related to the learning material. The given problem is accompanied by a suitable image. The column let's observe the problem can be seen in Figure 2

Figure 2. Column Let's Observe Problems

Students then identify the problem given through the problem identification stage with the ability to understand the problem. The problem identification column can be seen in Figure 3.

Setelah kamu mengamati masalah – 1 diatas, buatlah **rencana pemecahan masalah** dan tuliskan informasi yang diperoleh dari masalah tersebut !



**Ayo Menanya**

Mengorganisasikan siswa untuk belajar

**Diketahui**

.....

**Ditanya**

.....

Berdasarkan unsur-unsur yang diketahui dan ditanya yang telah kamu buat, ikuti langkah-langkah pada kegiatan "ayo mengumpulkan informasi" berikut ini untuk membantumu dalam menyelesaikan masalah!





Figure 3. Problem Identification Column

Students are then presented with the column let's collect information through the information gathering stage. The column let's collect information can be seen in Figure 4.



**Ayo Mengumpulkan Informasi**

Membimbing penyelidikan individu maupun kelompok

Untuk menyelesaikan masalah di atas, baca dan ikutilah petunjuk di bawah ini!

Misalkan jumlah buku adalah  $x$  dan jumlah pena adalah  $y$ . Sedangkan harga satu buku adalah Rp.3000 dan harga satu pena adalah Rp.2000. Dari masalah -1 di atas, Firman memiliki uang sebesar Rp. 18.000

1. Tulislah model matematikanya .....

Bentuk aljabar seperti  $3000x + 2000y = 18.000$  disebut persamaan linear dua variabel. karna, persamaan di atas memiliki dua variabel yaitu  $x$  dan  $y$ , dan masing-masing variabel tersebut berpangkat satu dan tidak ada perkalian di antara kedua variabel tersebut.

Selanjutnya kita dapat menyelesaikan persamaan linear dua variabel dengan menggunakan pasangan-pasangan berurutan dan grafik PLDV.

Untuk menentukan himpunan pasangan-pasangan berurutan, kita masukkan nilai  $x$  dengan sembarang bilangan cacah ke persamaan sehingga diperoleh nilai  $y$ .





Figure 4. Column Let's Gather Information

Based on the information obtained, students are then presented with the column planning completion with the ability to plan completion. The column planning for completion can be seen in Figure 5.



Sekarang kamu sudah tahu bentuk persamaan linear dua variabel. Sekarang lakukan penyelesaian masalah sesuai dengan yang telah kamu rencanakan !!





**Ayo Menalar**

Mengembangkan dan menyajikan hasil karya

1. Tentukan berapa masing-masing buku tulis dan pena yang dapat dibeli dengan uang sebesar Rp. 18.000? .....


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Figure 5. Column for Planning Completion

Students are then presented with the column let's solve the problem through the data processing stage with the ability to solve problems. The column let's solve the problem can be seen in Figure 6.



Periksa dan nyatakan kembali jawabanmu !!



Jadi dengan uang sebesar Rp. 18.000 Firman dapat membeli buku dan pena sebanyak.....


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Figure 6. Column Let's Solve Problems

Students are then presented with a column, let's draw conclusions through the generalization stage with the ability to check again. At this stage, students write down the conclusions obtained based on the material that has been studied. The column let's draw conclusions can be seen in Figure 7



AYO KITA SIMPULKAN

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Figure 7. Column Let's Draw Conclusions

Students are then given questions as exercises related to the learning material. The let's practice column can be seen in Figure 8.

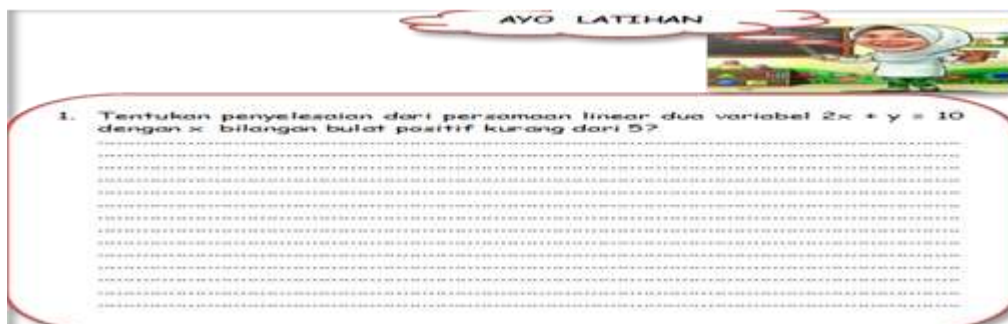


Figure 8. Column Let's Practice

The learning device is then developed based on a design that has been compiled and validated by three validators. The results of the analysis of the validity of the learning device which shows the average score of validity for the syllabus are presented in Table 3:

Table 3. Validation of Learning Devices

Learning Media	KPMM	SILABUS	RPP	LKPD
	81,41	82,99	85,75	83,23
Criteria	Valid	Valid	Very Valid	Valid

Based on the validity criteria of learning tools, KPMM questions, syllabus, RPP and RPP LKPD developed are included in the valid category, so that the learning tools developed can be used.

The learning tools were then tried out on eight grade VIII students of MTS GUPPI Bandar Sungai. The results of the practicality analysis of learning tools can be seen from the results of students' responses to the LKPD used in limited trials seen from the material aspect of 90.52%, from the aspect of the LKPD display it was 90.05% while from the aspect of using LKPD student responses were 92.00% .

LKPD is then revised according to suggestions and input from students. The revised learning tools were then tested on 60 grade VIII students of MTS GUPPI Bandar Sungai. Field trials were held five times to see the practicality of the syllabus, lesson plans, and student worksheet.

The results of the practicality analysis of learning devices can be seen from the results of students' responses to the LKPD used in field trials can be seen in Table 4.

Table 4. Average Results of Student Observation Sheets

Assessment Aspects	Percentage Average	Criteria
LKPD material	92,02	Very practical
LKPD display	90,60	Very practical
Use of LKPD	93,39	Very practical

Based on the practicality of using LKPD, it is already very practical, this means that the LKPD developed is very easy to use. The results of teacher responses can be presented in Table 5.

Table 5. Average Results of Teacher Observation Sheets

Assessment Aspects	Percentage Average	Criteria
Delivery of material	91	Very practical
Presentation of the syllabus	85	Practical
RPP presentation	92	Very practical
LKPD presentation	93	Very practical

Based on the description above, it can be concluded that the results of the research that have been carried out show that the learning tools with the application of a problem-based learning model with a scientific approach to the material of the two-variable linear equation system are valid and practical.

#### 4. Discussion

This development research was conducted with the aim of producing a product in the form of a learning device. The learning tools developed were KPMM test questions, syllabus, lesson plans and student worksheets by applying problem-solving based learning. The learning tools that have been developed are assessed for their validity, practicality and effectiveness. The validity test of the learning device was conducted by three validators. After the learning device is validated by the validator, then the results are analyzed and revisions are made. Furthermore, the revised equipment was tested in small groups to obtain data on LKPD readability and tested in large groups to obtain data on the practicality and effectiveness of the tools. The aspects assessed in the syllabus consist of (1) completeness of syllabus identity, (2) Clarity of KI and KD, (3) Clarity of competency achievement indicators, (4) suitability of learning materials, (5) suitability of learning activities with scientific process and approach standards, (6) Suitability of learning activities with process standards and Problem Based Learning models, (7) Suitability of learning outcomes assessment, (8) Suitability of learning resources with objectives, learning models and characteristics of students. This is based on the modification of the Sa'dun Akbar Modification (2015). The validation results show that the syllabus meets the valid criteria with the average percentage of Validator-1 is 81.25%, Validator-2 is 83.33%, and Validator-3 is 84, 38%. This shows that the syllabus developed is in accordance with the components of the Permendikbud syllabus Number 22 of 2016. However,

there are suggestions from the validator, namely to provide a real picture in everyday life, so that students are easier to understand.

Furthermore, the results of the validation of the lesson plans developed were analyzed. Assessment of the RPP Aspect consists of: (1) completeness of RPP identity; (2) clarity of KI and KD; (3) clarity of the formulation of competency achievement indicators; (4) conformity of the formulation of learning objectives with achievement indicators; (5) suitability of learning materials; (6) conformity of learning activities with process standards; (7) suitability of KPMM learning activities; (8) suitability of learning tools, media and resources with the objectives, learning models and characteristics of students; and (9) appropriateness of learning outcome assessment. The results of the validation show that the lesson plans for the five meetings meet the very valid criteria with the average percentage of Validator-1 being 84.31%, Validator-2 being 86.27%, and Validator-3 being 86.67%. RPP in accordance with the components of RPP Permendikbud No. 22 of 2016. However, the validator provides input on the introduction to the RPP in order to provide various motivations. The researcher then revised the lesson plan based on suggestions from the validator.

Furthermore, an assessment of the LKPD developed aspects, namely: (1) completeness of the LKPD components; (2) suitability of learning materials; (3) presentation of learning material; (4) suitability of LKPD with the steps of the Scientific Approach; (5) suitability of LKPD with problem-based learning steps, (6) suitability of LKPD with KPMM; (7) the suitability of the LKPD with the level of ability of students; (8) accuracy in choosing the words and language used; (9) letters used in LKPD; (10) the image presented in the LKPD; and (11) LKPD display. The results of the validation of the validator met the valid criteria with an average percentage of Validator-1, namely 82.55%, Validator-2, namely 82.42%, and Validator-3, namely 84.71%. as a whole is in the "valid" category. So it can be concluded that the developed LKPD meets the requirements of a good LKPD. After the revision was completed, the researcher then tested the LKPD for 8 students. This is done to see the readability of students against the LKPD that has been developed. The same thing was expressed (Ahmad et al., 2017) that the readability test process is the process of seeing students towards the readability of learning tools. The results of the student response questionnaire to LKPD in the limited trial were seen from the material aspect of 90.94%, from the aspect of the LKPD, the response of students was 90.27%, while from the aspect of using LKPD, the response of students was 92.19%. developed has met the practical criteria used by students. Then a large group trial was carried out. This large group trial was carried out with the aim of seeing the practicality and effectiveness of the tools that have been developed so far. The same thing was expressed (Oktaviani et al., 2017) which states that the practicality of the learning tools developed can be seen from the analysis of the results of teacher and student assessment questionnaires, as well as the results of observations of the implementation of learning in pilot class However, in this study researchers used student response questionnaires and teacher response questionnaires. Questionnaires are used to determine the feasibility of learning according to the learning design of the device (Roliza et al., 2018). Observation sheets are given to

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observers at each meeting to find out the practicality of the syllabus and lesson plans. The aspects contained in the student response questionnaire consisted of 3 aspects, namely: (1) material; (2) display; and (3) the use of LKPD. Meanwhile, the teacher response questionnaire consisted of 4 aspects, namely: (1) presentation of the material; (2) presentation of the syllabus; (3) presentation of RPP; and (4) presentation of LKPD, which applies the concept of problem solving learning.

The results of data analysis on the student response questionnaire were seen from the material aspect of 92.02%, from the aspect of the LKPD appearance of 90.60% while from the aspect of using LKPD the student response was 93.39%. Overall the LKPD developed has met the very practical criteria. Furthermore, the results of the questionnaire analysis of the teacher's response in the delivery of material aspects were 91%, the aspect of presenting the syllabus of the teacher's response was 85%, the RPP presentation aspect was 92% while the LKPD presentation aspect was 93%. This means that the device being developed is "very practical" to use. Students say the LKPD developed can help students understand the two-variable linear equation problem.

Furthermore, the results of the teacher's response at the field trial stage showed that the learning tools consisting of the syllabus, lesson plans, and student worksheets to meet the criteria were very practical. The learning device is said to be good if the learning achievement / teacher's ability to manage learning is at least good enough. However, in this study the aspects to be observed consisted of four (1) presentation of the material; (2) presentation of the syllabus; (3) presentation of RPP; and (4) LKPD presentation.

The effectiveness of the developed learning tools can be seen from the completeness of the test results of students' mathematical problem solving abilities in a classical way. Then the researcher tested the average difference in mathematical problem-solving abilities between the experimental class and the control class. This test was conducted to see the increase in students' mathematical ability in problem solving abilities. Based on the mathematics completeness test of the students' problem solving ability, it was found that the percentage of students who reached the KKM after using the developed mathematics learning tools was 87.09%. So it can be concluded that the learning tools developed are effective for improving mathematical problem solving abilities in the material of two-variable linear equations.

Furthermore, to see the magnitude of the influence of the use of problem-based learning mathematical learning tools with a scientific approach to improve students' mathematical problem-solving abilities in the two-variable linear equation system material on improving student learning outcomes, the researchers used the t test. Based on the results of the t test, the average pretest score in the experimental class was 40.24 and the pretest in the control class was 43.91 after using the PBL learning model the average posttest value was 78.48 in the experimental class and 41.59 in the control class. . Then it can be explained that there was an increase of 36.24% in the experimental class.

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Based on the description above, it can be concluded that the results of the research that have been carried out show that learning tools with the application of a problem-based learning model with a scientific approach to improve students' mathematical problem-solving abilities on the material of the two-variable linear equation system are valid, practical, and effective. The results of this study are in line with what Anik stated (2017) that the learning device developed is said to be of quality if it meets three criteria, namely valid, practical, and effective. The results of validation, limited trials, field trials, and final product tests show that the learning tools with the application of a problem-based learning model with a scientific approach to improve students' mathematical problem-solving abilities in the material of two-variable linear equation systems are valid, practical, and effective. .

Based on the results of the study (Ningsih, 2017) states that learning tools with a problem-based learning model can improve problem-solving abilities. (Aufika, 2015) also argues that the application of a problem-based learning model can improve problem-solving abilities. (Insani, 2014) also argues that the development of learning tools with a problem-based learning model on SPLDV material meets valid and practical criteria. This is in line with the results of research that has been carried out that the development of learning tools for the application of problem-based learning models on SPLDV material meets valid and practical criteria and can improve students' problem solving abilities.

One of the mathematics materials that can be taught by applying the problem based learning model is a two-variable linear equation system. Based on the research results (Hapsari, 2015), the material of the two-variable linear equation system with the application of a problem-based learning model can improve student learning outcomes. Problems in the two-variable linear equation system material can be presented with the application of a problem-based learning model so that students can find concepts and solve problems in two-variable linear equation systems. This is in line with the results of research that has been done that learning tools can be developed by applying a problem-based learning model to the material of the two-variable linear equation system for class VIII SMP / MTS.

## **5. Conclusion**

The development research carried out has produced products in the form of learning tools in the form of syllabus, lesson plans and student worksheets with problem-based learning models on the material of linear equations for two variables of class VIII SMP. Based on the results of the research that has been done, it can be concluded as follows.

1. The learning device developed by applying the problem-based learning model to the material of the two-variable linear equation system for class VIII SMP fulfills the validity criteria.
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2. The learning tools developed with a problem-based learning model on the material of linear equations of two variables in class VIII SMP meet the practicality level, which is very practical.

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